Competition and well-being

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September 14, 2005

Abstract

This paper experimentally studies the effects of competition in an environment where people's actions can not be contractually fixed. We find that, in comparison with no competition, the presence of competition does neither increase efficiency nor does it yield any gains in earnings for the short side of the exchange relation. Moreover, competition has a clearly negative impact on the disposition towards others and on the experienced well-being of those on the long side. Since subjective well-being improves only for those on the short side competition contributes to larger inequalities in experienced well-being. All in all competition does not show up as a positive force in our environment.

JEL Classification Numbers: A13, C92, D30, J50, M50

Keywords: competition, happiness, well-being, laboratory experiment, emotions, market interaction

*The authors thank Armin Falk, Ernst Fehr, Christiane Schwieren, Alaž Ule and the participants of seminars and conferences in Amsterdam, Barcelona, Erfurt, and Zürich for valuable comments, David Rodriguez for excellent research assistance, Karin Breen for the translation of the experimental instructions and Jos Theelen for writing the software for the experiment. Financial support by the European Union through the TMR research network ENDEAR (FMRX-CT98-0238) is gratefully acknowledged.

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1 Introduction

Economists have extensively studied many aspects of the effects of competition for different contexts, as for markets for labor, financial capital, natural resources or commodities. From these studies a strong consensus in mainstream economics concerning the effects of competition has emerged. The spur of competition is generally regarded as the key ingredient for improving efficiency and welfare. The title of a recent piece on competition in The Economist's Economics Focus puts it in a nutshell: "Competition is all" (December 6^{th}, 2003, p. 74). This positive view of competition relies on two important assumptions. Firstly, that preferences and well-being of economic agents are independent of the institution under which the economic activities take place, *ceteris paribus*, and, secondly, that complete contract enforcement is possible.

In this paper, we experimentally investigate the consequences of competition in an incomplete contract environment. Our results strongly indicate that competition influences peoples' subjective well-being and disposition towards others mainly negatively without having positive effects on efficiency and welfare in a material sense.

Our study builds upon the idea that (social) preferences and tastes may not be independent of the institutional environment. For instance, Bowles (1998), argues that different kinds of institutions may affect values, tastes and personalities. A particularly important issue he discusses is closely related to the concern about the effect that competition can have on well-being. In his own words: "(...) there are significant differences in the personality effects on participants in markets (...) for people on the short side (...) and those on the long side of the market, some of which are simply excluded from the exchange process, while others fear losing the transactions they have secured." (Bowles, 1998, p. 78) This statement suggests that people's well-being is influenced by the competitiveness of the environment and the side one is on in such an environment.

In a similar vein, Rabin (1993, p. 1283) argues that "Welfare economics should be concerned not only with the efficient allocation of material goods, but also with designing institutions such that people are happy about the way they interact with others."

There are several reasons why it is important to investigate the relationship between competition and well-being. Well-being and happiness are undoubtedly central

goals in human life. This by itself is a good reason for studying their relation to different economic institutions. Kahneman, Diener and Schwartz (1999) provide a wealth of information about the importance of well-being. Recent overviews about research into happiness and well-being and its relation to economics is provided by, e.g., Frey and Stutzer (2002), Krueger (2005), and McFadden (2005). The concern for how the environment affects people is also related to issues of procedural fairness. The degree of competitiveness may be viewed as one aspect of the procedure under which interaction takes place. By now there is considerable evidence that supports the premise that satisfaction with process and procedures is an important ingredient of human motivation.[1]

Beyond these direct consequences of competition on well-being there are potentially also derived consequences. As argued by Bowles (1998) the experience of competition may have an effect on people's social values. More specifically, interacting under competition may change people's disposition towards others and, in particular, towards those individuals they have encountered in the interaction (and may meet again in the future). These potential effects of competition have not received much attention in economics, but need to be studied in order to get a more complete picture of the impact of competition on economic and social life. We investigate both the direct as well as the derived effects of competition on well-being.

The second building block of our study is motivated by the fact that many if not most economic interactions are contractually incomplete. A stream of theoretical studies initiated by Akerlof's (1970) seminal 'Lemons Market' paper has shown that competition alone is not sufficient to guarantee allocative efficiency (e.g. Klein and Leffler, 1981; Shapiro and Stiglitz, 1984; Levin, 2003). Experimental studies of exchange situations with incomplete contracts have corroborated this view and, moreover, shown that the validity of economic analysis based on standard assumptions of narrow selfishness and rationality may be considerably limited (Fehr, Kirchsteiger, and Riedl, 1993, 1998;

[1]Kahneman, Knetsch and Thaler (1986), Barret-Howard and Tyler (1986), and Bies, Tripp and Neale (1993) find that procedural information influences judgments of market exploitation. Charness and Levine (2000) find that perceived fairness of a layoff is highly dependent on the manner in which the layoff is implemented. Bolton, Brandts and Ockenfels (forthcoming) show that different random procedures affect choice behavior. Frey, Benz and Stutzer (2002) outline a concept of procedural utility and suggest how it can be fruitfully integrated into economics. For a summary of some of this literature see Lind and Tyler (1988).

Fehr, Gächter, and Kirchsteiger, 1997; Fehr and Falk, 1999; Hannan, Kagel, and Moser, 2002; Brown, Falk, and Fehr, 2004; Brandts and Charness, 2004).

These studies have greatly increased our knowledge about the problems and possible solutions of contractually incomplete exchange situations. However, there is still a lack of knowledge and evidence of the effect of competition *per se* in incomplete contract situations. With this study we contribute to filling this gap.

We use laboratory experiments to study, in a single incomplete contract environment, the effects of competition on efficiency and well-being in a material sense as well as on subjects' subjective well-being and their disposition towards others.

Our experiment is designed in a way that makes it possible to control for the effects of competition as such. We compare subjects' behavior in an experimental condition in which competition is present with behavior in another condition where competition is absent, while holding all the other aspects of the economic environment constant. In our design it is completely transparent whether one is interacting under competition or not. Competition appears in such a way that it is always clear who is on the long and who on the short side of the interaction. As a cautionary note we want to stress, that while our design captures the essential aspects of competitive rivalry, as defined by Stigler (1987), who writes, that "competition is a rivalry between individuals (or groups or nations), and it arises whenever two or more parties strive for something that all cannot obtain" (p. 531), it naturally does not cover all potentially important aspects of competition. In particular, we do not deal with the kind of full-fledged atomistic competition that is often studied in economics. We also do not study other potentially important features of competition like how it contributes to selecting alternatives that are better ex-ante as, for instance, technically more efficient ones.

Another innovative feature of our design is that we collect data about people's subjective well-being and about their disposition towards others. We use the notion subjective well-being similarly to Kahneman, Wakker and Sarin's (1997) notion of 'experienced utility', which goes back to Bentham. As these authors we claim that subjective well-being (or experienced utility) is both measurable and empirically distinct from standard decision utility. The actual measurement consists of self-reports concerning a general measure of the hedonic state experienced by our subjects, as well as

concerning the intensities of experienced specific emotions.[2] The dispositions towards others is measured with a variant of the social value orientation test (Liebrand 1984), which involves the allocation of real money.

We measure subjective well-being and the disposition towards others in both experimental conditions, i.e., with and without competition, which allows us to study the impact of competition on these measures in a controlled way. In the environment with competition we can also distinguish between well-being on the short and on the long side of the interaction. We also study how subjective well-being and disposition towards others in the different conditions are related to interaction success (monetary earnings) in the incomplete contract environment.

We find that in our experimental representation of an environment with incomplete contracting the very presence of competition does not show up as a positive force. In our experiment competition does not lead to an increase of efficiency (in terms of total earnings) and does not yield any material gains to the short side of the interaction. In addition, it leads to lower subjective well-being for participants on the long side of the interaction compared to those not subject to competition. Only the subjective well-being of those on the short side is improved, implying that competition leads to an increase in inequality in experienced utility. Moreover, competition has an adverse impact on the disposition towards others of those on the long side.

An important question is whether the observed differences in subjective well-being can be attributed to differences in earnings from the incomplete contract game. What our data show is that earnings (differences) alone are not sufficient to explain the differences in subjective well-being but that the environment itself and the role taken in this environment are important, too. Finally, regression analysis shows that people's disposition towards others after the experience in the incomplete contract game is differently affected, depending on their position. Generally, the disposition of agents on the long side towards those on the short side deteriorates, independently of the interaction success (earnings). Specifically, agents who are often excluded from trade show little sensitivity in their disposition towards others with respect to interaction success. It seems that they are frustrated by the exclusion and that the rare events

[2] According to Robinson and Clore (2002), self-reports are the most common and potentially the best way to measure a person's emotional experience. A recent account of the usefulness of such measures of subjective well-being for policy evaluation is provided by Krueger (2005).

where they are not excluded are insufficient to overcome this effect. This supports the conjecture of Bowles (1998) concerning the "personality effects" of competition (see quote above).

Note that it would be difficult to do our study on the basis of field data alone, since in natural environments it would be impossible to find adequate data with the desired variation in competitive conditions. It probably would have been even harder to obtain controlled information about subjective well-being and disposition towards others which, in addition, would also have had to be connected to the competitiveness of the economic environment. In contrast, laboratory experiments make it possible to generate this kind of evidence in a systematic manner.

The rest of the paper is organized as follows. In Section 2 we present in detail our experimental design and procedures. In Section 3 we present and discuss our results and Section 4 contains some closing comments.

2 Design and Procedures

In our design competition takes place in a stylized representation of a situation with incomplete contracting and repeated interaction between two fixed sides of a relationship. Ongoing relationships, which are characteristic for many if not most market and organizational environments, are the natural context in which to study the issues at hand. Such an environment opens the possibility for psychological effects of competition to accumulate over time.[3]

Our experimental set-up consists of two treatments each of which has three parts. In part 1 subjects make decisions in the circle-test, a task designed to elicit people's initial disposition towards others. Part 2 is a finitely repeated social dilemma game played by a fixed group of subjects. In part 3, participants' subjective general well-being and experienced emotions are measured using a computerized self-assessment questionnaire. This is followed by a second application of the circle test measuring subjects' post-interaction disposition towards others. Table 1 depicts the sequence of events. The data from part 1 yield information to control for people's baseline disposition towards

[3]For instance, Lawler, Yoon, Baker, and Large (1995) state that frequent exchange creates emotional ties between the parties involved.

Table 1: Sequence of events

0.	General information → experiment consists of three parts	
	PART 1	
1.	Instructions for first circle test only	
2.	Circle test concerning random stranger	
	PART 2	
3.	Instructions for interactive game	
	in NCC	in CC
4.	Incomplete contract game in dyad	Incomplete contract game in triad
	PART 3	
5.	Measurement of general subjective well-being	
6.	Measurement of specific emotions	
7.	Instructions for second circle test	
	in NCC	in CC
8.	Circle test concerning partner and random stranger	Circle test concerning both interaction partners

others. Part 2 is where we observe interactive behavior under different conditions. Part 3 is where we measure the repercussions of what occurs in the interactive phase.

In the following we present each of these parts in detail. The two treatments (conditions) differ mostly with respect to the interactive game played in part 2. We, therefore, start with the description of this part.

Part 2 - The interactive game: In the *No Competition Condition* (hereafter NCC) the repeated game in part 2 is played in a dyad, by a *pair* of fixed partners, labeled A and B. In contrast, in the *Competition Condition* (hereafter CC), the game involves a *triad* of fixed players with fixed roles: A, B and C.[4]

In both the NCC and the CC the number of repetitions (rounds) is 30. In each round of the game in the CC the subject in the role of A has to choose to play *either* with B *or* with C. Since player A can only choose one of the other two players the situation of players with roles B and C is one of competition as defined by Stigler (1987) (see quote in the Introduction). Thus, the situation in the CC incorporates in a simple way the presence of competition we want to study.

[4] A related game is studied in Davis and Holt (1994).

The stage game of the repeated social dilemma game implemented in part 2 is shown in Figure 1. The representation corresponds directly to the NCC condition, where the game is played by two fixed partners, A and B. In each round the two players simultaneously choose between the numbers 0 and 10. The choice possibilities represent 'cooperation' and 'no cooperation' in a social dilemma situation and may be interpreted as, e.g., wage and effort choices in a gift-exchange framework or quality and price choices in markets of experience goods. Below, we refer to the choices as (rates of) cooperation. The CC condition involves one more choice for one of the players. In each round of the CC, player A also chooses between two partners, B and C. Player A and the chosen partner then play the above game while the not chosen player obtains a fixed payment of 90 points.[5] Note that at the outset the B and C players are identical.

	0	*10*
0	$160, 160$	$410, 40$
10	$40, 410$	$290, 290$

In CC the player not chosen receives 90.

Figure 1: The stage game

The fact that both A and the chosen partner can freely choose their action in a round represents an incompleteness of contracting on both sides of the business relation. We consider this to be more interesting than the case of one-sided incompleteness in which one side's responsibilities are completely fixed. It also makes the players symmetric with respect to the choice possibilities. This is a desirable feature because we want to isolate the effect of competition from possible influences related to choice or payoff asymmetries. This is also the reason why the stage game is symmetric with respect to the payoffs. The symmetric set-up facilitates a straightforward comparison of behavior and earnings across different conditions and player types.

[5]Note that the outside payoff is dominated by the payoffs that a B or C player can obtain if he is chosen by A and chooses 0. However, the outside payoff is higher than what one gets if one chooses 10 and the A player 0. In terms of a business relation the situation can be interpreted as one in which for firms B and C it is worse to contribute to the relation and being taken advantage of than no to get the contract with A at all. Another possible interpretation is a hold-up problem with opportunistic behavior of the employer after a relation specific investment of the employee. In this case, the payoff of 90 can be interpreted as the ex-ante outside opportunity of the employee.

In the experiments, subjects in the role of B and C made their choice before they knew whether they had been chosen by A. This procedure yields a more complete picture of behavior than a sequential choice set-up and also allows us to compare the behavior of matched and unmatched players.[6] Subjects' information depended on the role they were in: In each round, player A was only informed about the choice of the selected player and the B or C player was only informed of A's choice if he had been selected. In our view, this information structure is quite natural since in many business and other economic exchange situations the terms of the implicit contract are typically not revealed to third parties.

In our design the presence or absence of competition is an exogenously given feature, which facilitates the analysis of the effects of competition as such. The fact that there is only one player on the short side of the exchange relation is an additional advantage of our environment, for the following reason. At all times, it is transparent to all three players in a triad whether B or C is unmatched. If after a period of interaction an A player switches away from, say, the B player then the latter player will be unmatched with certainty in the next round.[7] If there were more than two players on the long side, then the issue would arise whether to inform unmatched players about which of the players had been matched. This information could have an influence on behavior, a possibility we want to avoid.

In our setting the advantageous position of the A player is obvious. Actually, the B and C players can be seen as being at A's mercy, since they do not have a proper refusal possibility. Examples of such situations are the competition between workers for being selected by a superior for a promotion or cases of procurement where several firms compete offering similar inputs. One might also think of situations in smaller towns or at the workplace, where turning down a work-related or business proposal is socially very difficult. Recall, that in our setting the chosen player on the long side can guarantee himself a payoff higher than the outside option payoff. In this sense, it is always better to trade than not to trade.

[6]The procedure has an additional advantage. The alternative of letting A select a partner before the simultaneous play of the stage game could have influenced behavior of the B/C players (see, e.g., Brandts, Güth, and Stiehler, forthcoming). This is an interesting effect but is separate from the issue we are interested in here. Note, that our procedure is also related to Selten's (1967) strategy method.

[7]For the CC the whole situation evokes the notion of unemployment being used as a disciplining device; see Shapiro and Stiglitz (1984).

The game-theoretic predictions based on the standard assumption of (common knowledge of) rationality and narrow material self-interest differ across the two treatments. For the NCC the prediction is straightforward. Since the stage game has the incentive structure of a prisoners' dilemma game both players choose 0 in the unique Nash equilibrium. Consequently, the repeated game has also only one Nash equilibrium, which is subgame-perfect: both players choose 0 in each round.

For the CC the standard predictions are rather different. The stage-game now has two Nash equilibria in pure strategies in which all three players involved choose action 0. The only difference between them is whether A chooses B or C as partner. Importantly, however, the two equilibria are not payoff-equivalent. As a consequence, our finitely repeated CC game also has multiple Nash equilibria and some of them are subgame-perfect. One subgame-perfect equilibrium involves all three players choosing the non-cooperative choice in every round. However, there are also numerous other subgame-perfect equilibria involving different levels of stable relations between player A and his partners and different degrees of gains from cooperation for players.[8] The theoretical prediction of multiple equilibria with and without gains from cooperation in our CC is akin to the findings of MacLeod and Malcomson (1989). They show that in repeated labor relations with incomplete effort enforcement many equilibria exist. Some of them involve cooperation with rent extraction whereas others are equivalent to the competitive Walrasian outcome without any rents.

[8]For illustration, consider the following set of subgame perfect equilibria all involving one of the players on the long side, say C, always defecting and A choosing B as a partner. In the first k_1 rounds A and B both cooperate, in the second k_2 rounds A defects and B cooperates and in final k_3 rounds both A and B defect, where $k_1 < k_2 < k_3, k_1 + k_2 + k_3 = 30$. In case of a deviation by A, B changes to defection in all remaining rounds. In case of a deviation by B, A switches to choosing C as partner and defects in all subsequent rounds. (We are grateful to Aljaž Ule for providing us with this example.) The punishment corresponding to switching to the other player is credible. Indeed, the described strategies prescribe that after any deviation all players follow the non-cooperative Nash equilibrium strategy. Note, that all of these equilibria involve all three players choosing the non-cooperative action 0 in the last two rounds. To see this, observe that if, say, B is chosen in the last round he will earn 160, because all players choose the non-cooperative action in that round, implying a gain of 70 relative to the exclusion payoff of 90. This loss of 70 is smaller than the gain from a deviation in the previous round, $410 - 290 = 120$. Considering the last two rounds, however, it is clear that the one-time deviation gain of 120 can not compensate for twice foregoing earnings of 70. This kind of analysis is akin to the one suggested by Friedman (1985), Frayssé and Moreau (1985) and Benoit and Krishna (1985).

What we wish to highlight here is that even under the standard game theoretic assumptions there are subgame perfect Nash equilibria that imply considerable cooperation in the CC. The rivalry on the long side of the exchange situation turns the repeated social dilemma into a coordination game. The question is whether competition helps players to coordinate on efficient equilibria. For instance, there is plenty of experimental evidence that in competitive markets with complete contracts people very quickly coordinate on the efficient Walrasian equilibrium (e.g., Davis and Holt, 1993). We are aware of the fact that these markets are different from our set-up in so far no clear-cut game theoretic predictions are known for them. Nevertheless, it seems a natural question to ask whether such an 'invisible hand' hand is also at work in a competitive incomplete contract setting as implemented in our experiment. Since such arguments can not be made for the NCC one may expect higher cooperation rates in the CC than in the NCC.[9]

Social or other-regarding preferences can transform the social dilemma games into coordination games in both conditions and can therefore lead to cooperation in the CC as well as the NCC. For instance, with the type of distributional preferences posited by Fehr, Kirchsteiger and Riedl (1998), Fehr and Schmidt (1999) or Bolton and Ockenfels (2000) both our stage games can have an equilibrium without cooperation, but also have equilibria in which some subjects cooperate while others defect.[10] The possibility of cooperation in the repeated versions of the NCC game follows straightforwardly. In the repeated CC game the pattern of cooperation may depend on whether players only care about the distribution of payoffs between themselves and their chosen partners, or

[9]The discrepancies in the predictions for the two conditions can also be compared to those for an analogous pair of situations with a fixed surplus to be divided. The Nash demand game can, due to its symmetry, be seen as the fixed surplus game parallel to the NCC stage game. Although, any division of the surplus is a Nash equilibrium in the demand game, the equal split seems to be a reasonable prediction, and this is what was found in the experiments reported in Nydegger and Owen (1975). The same situation involving two buyers is an auction with secret reserve price where the only Nash equilibrium implies the whole surplus going to the seller. Here competition clearly favors the short side of the market. Güth, Marchand and Rulliere (forthcoming) present experimental evidence from an ultimatum game with responder competition in which the proposer actually obtains almost all the surplus. Roth, Prasnikar, Okuwo-Fujiwara and Zamir (1991) find similar results in a Bertrand-type auction.

[10]Other models of social preferences like Dufwenberg and Kirchsteiger (2004), Falk and Fischbacher (1998) and Charness and Rabin (2002) predict similar patterns.

whether they also take into account the unmatched player. In the first case, equilibrium cooperation could involve a stable relation between player A and one of the other two, whereas in the case in which third party payoffs are also relevant some degree of switching between the two players would be involved.[11]

In summary, for the games just discussed theory suggests a plethora of possible types of behavior implying that theoretical reasoning alone gives us an incomplete picture about the allocative and distributional effects of competition. Our experimental results will help to complement this view.

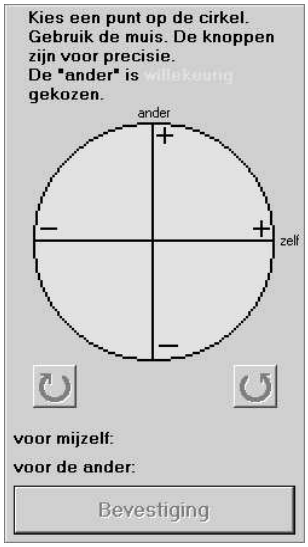
Part 1 - Initial disposition towards others: In part 1, prior to the interaction phase just described, we recorded participants' decisions in the circle test, which is a modified version of the ring-test (Liebrand, 1984) and was successfully applied by Sonnemans, van Dijk and van Winden (forthcoming). It is a task which allows for a quantification of people's disposition towards others by determining the readiness of individuals to help or hurt others at some cost to themselves.

In the circle-test a person's disposition towards another person is measured by a decision which consists in the selection of a point on a circle. Figure 2 shows the circle test used in part 1 of both treatments. Each point on the circle represents an allocation of points to the person who makes the choice (S) and to another person (O). The amounts allocated can be positive or negative, with $S^2 + O^2 = 1000^2$. Each point on the circle also corresponds to a certain angle.[12] It is possible to choose $S = 1000$ and $O = 0$. Other choices of O lead to $S < 1000$. Importantly, in the experiment these numbers translate into money earnings at the exchange rate of 1000 points equal to € 2,30 (≈ US $ 2,50 when the experiment was conducted). Hence, decisions in the circle-test have pecuniary consequences.

In both treatments subjects had to make circle-test decisions with respect to other subjects. Before the interactive phase of part 2 began and before even knowing the content of this phase, thus also not knowing whether they were in the NCC or the CC

[11]The reputation formation model of Kreps, Milgrom, Roberts and Wilson (1982) can also explain cooperation in both the NCC and the CC conditions.

[12]The circle appeared on subjects' computer screen. Subjects received computerized instructions about how to make the decision and had ample opportunity to practice. The angles that subjects could choose were positive (negative) for the cases where the other player obtains some positive (negative amount).



Translation:
Choose a point on the circle.
Use the mouse. The buttons are for precision.
The "other" is arbitrarily chosen.

for myself:
for the other:
Confirmation

Figure 2: The circle test in part 1

condition, each subject chose an angle with respect to one anonymously and randomly chosen other subject. These initial angles towards a stranger measure the 'social value orientation' or the disposition towards generalized others. Subjects were not informed about the decision of 'their' strangers in the circle test until the very end of the session.

Part 3 - Post-interaction well-being and disposition towards others: In part 3 of the experiment we measured the effects of the interaction in the incomplete contract game on subjects' subjective well-being and emotions as well as their dispositions towards others.

After the last round of the interactive game, and without knowing beforehand, subjects had to respond to a computerized questionnaire designed to elicit participants subjective well-being. They were asked to rate themselves with respect to a general subjective well-being indicator as well as with respect to thirteen specific emotions.[13] The questionnaire used has previously successfully been applied by Bosman and van Winden (2002). We explain the general measure of subjective well-being and the emotions questionnaire in detail when we present the results on subjective well-being in Section 3.2.

[13]For more general discussions about the role and importance of feelings and emotions in economic contexts see Loewenstein (2000), Lawler and Thye (1999) and Elster (1998).

Right after answering the questionnaires subjects had to make two new circle-test decisions. In the CC each subject chose angles relative to each of the two other subjects in the triad. In the NCC each subject made one choice relative to his partner and - to keep the number of decisions constant across treatments - another choice relative to a randomly chosen third subject, a stranger.

We hypothesize that the intensity of the emotions as well as the disposition towards others will be be related to experience and interaction success during the interactive part as well as the role and institution subjects are immersed in. We will report on the measures of subjective well-being and disposition towards others as well as their relation to interaction success and the institution in part 2 of the experiment.

We collected data for 153 subjects. Each subject participated in only one session. We conducted four CC sessions with 81 subjects in 27 triads. For the NCC 72 subjects participated in 36 dyads in four NCC sessions. We have, therefore, 26 [36][14] and 27 statistically independent observations. All sessions were run computerized at the CREED laboratory at the University of Amsterdam. The average (net of show-up fee) earnings per subject was € 23,– (≈ US $20,–). A typical session lasted approximately 90 minutes. The instructions of the experiment can be downloaded from 'http://www.fee.uva.nl/creed/pdffiles/instr2compwellbe.pdf'.

3 Results and regularities

We first present the results from the different parts of our design separately. In Section 3.1 we present the results pertaining to the social dilemma games, concentrating on questions of efficiency and earnings. In Sections 3.2 and 3.3 we report the results concerning subjects' experienced well-being and emotions and their disposition towards others, respectively. In Section 3.4 we relate the data generated in the different parts of the experiment to each other. Particularly, we explain how post-interaction well-being and disposition towards others depends on earnings and other features, like competitiveness, of the interaction phase. We formulate our main findings in terms of a number of specific results as well as in terms of some more qualitative regularities.

[14]For the NCC we have complete data for only 52 participants (26 pairs). For the other 20 participants we have all information except the decisions in the first circle test. This was due to computer problems in one of the NCC sessions.

3.1 Competition, efficiency and earnings

Figure 3 shows the development of average cooperation rates over the 30 rounds for both the CC and the NCC, which also represents attained efficiency levels in terms of earnings. Recall that 10 is the cooperative choice and 0 the non-cooperative one.

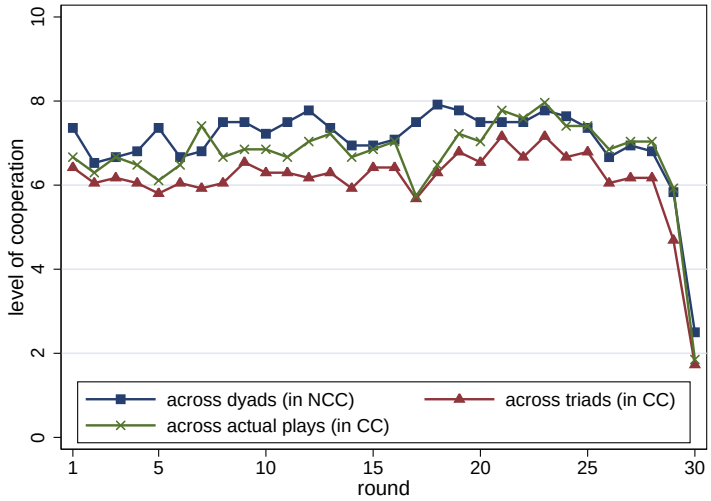


Figure 3: Development of the level of cooperation (efficiency) in NCC and CC

For the NCC cooperation levels are the average over the two involved players (dyads), while for the CC we distinguish between across groups (triads) - the average cooperation level of all three players A, B and C - and across plays - the average cooperation level involving only A players and the actually chosen B or C players. For all three series no large variations across rounds are observed, except for a rather stark end-game effect.[15] We focus on the comparison of cooperation levels across treatments.

Result 1

A. There is no difference between cooperation levels in the NCC and in the actual plays in the CC.

B. The cooperation levels in the NCC are (marginally) larger than the cooperation levels across triads in the CC.

For NCC the average cooperation level is 7.04 and the standard deviation is 3.39, while for the CC across plays the corresponding values are 6.71 and 3.06. The Mann-

[15]Such an end-game effect has been found in many other experiments on public goods and social dilemma games. It does not affect our treatment effects.

Whitney test[16] does not reject the hypothesis of equal average levels ($p = .2001$). Across the triads in the CC the average cooperation level is 6.12 and the standard deviation 2.87. In this case the Mann-Whitney test detects a marginally significant difference ($p = .0524$).[17]

The above result shows that in our experiment competition does not lead to more efficiency in terms of earnings and, hence, that competition is not a very successful coordination device in the CC. At the same time, results 1A and 1B together indicate that actual pairings seem to be important. Below we will unveil what is behind this feature of the data.

Another interesting issue is whether in the CC the long side or the short side of the exchange relation cooperates more. Intuition may suggest that player A may sometimes take advantage of his position of power, behave opportunistically and that this may be the main source of inefficiency. Recall, that such opportunistic behavior can be part of an equilibrium strategy. Connected to this issue is the question whether the short or the long side earns more.

Result 2 refers to the earnings levels of the players in the different roles providing an answer to the question whether the short side can extract rents due to the competition on the long side.

Result 2

A. There is no difference in average earnings between A players in the CC and players in the NCC.

B. There is no difference in average earnings between the selected B or C players in the CC and NCC players.

C. The standard deviation of A's earnings across rounds in the CC is larger than for players in the NCC.

In the NCC the average earnings per round were 252.2 and in the CC the A players' average earnings per round were 251.6. A Mann-Whitney test testing the equality of these earnings yields $p = .2659$ (Result 2A). The average per round earnings of the chosen B/C players were 238.7. (Note, that these earnings are calculated on the basis

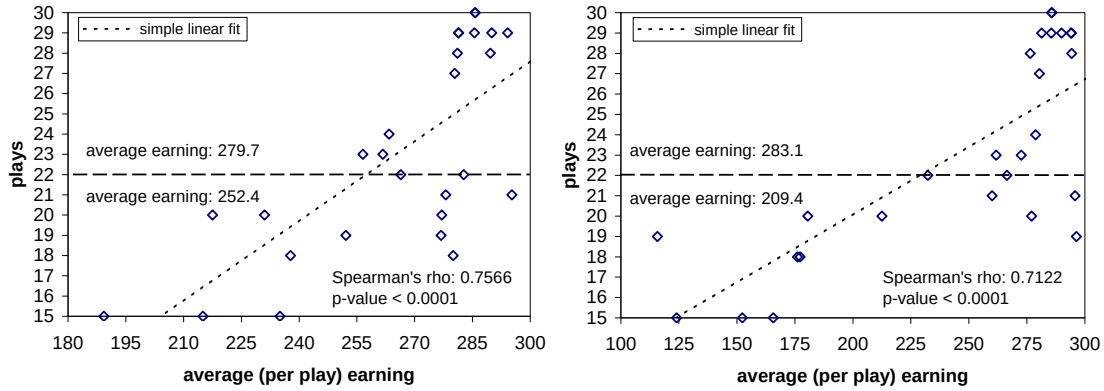
[16] If not otherwise indicated all tests are two-tailed and the unit of observation is the group.

[17] All results remain qualitatively the same when the last two rounds are excluded.

that a B/C player is chosen and do not include the outside payoff of 90.) Comparing these B/C players' earnings to the per round earnings of players in NCC yields $p = .1960$ (Mann-Whitney test) which supports Result 2B. The standard deviation of earnings across rounds and across A and B players in NCC is 65.43 (n=72). For A players in CC the standard deviation of earnings across rounds is 89.59 (n=27). A Mann-Whitney test shows that this difference is highly significant ($p = .0079$). This supports part C of the above result. Similarly, significant results are obtained when comparing A players' standard deviations in earnings in CC with those of A and B players in the NCC separately. The earnings per round of the B/C players who have been chosen more (less) often as an interaction partner amounted to 216.4 (116.5). Note, that these earnings include the outside payoff of 90 when not chosen.

One can interpret Result 2 as having negative implications for the allocation of resources. The fact that in many exchange environments the short side obtains a large part of the available surplus is usually considered to have the allocative virtue of attracting resources to that side. This incentive seems not to be present in our environment, if one compares the short side's earnings with that of the NCC. In addition, the fact that the standard deviation of earnings is higher for the A players in the CC than in the NCC shows that being on the short side in the CC is not such a favorable position as one might expect intuitively and theoretically. Competition leads to more income uncertainty for agents on the short side of the exchange relation.

Up to this point we have documented the fact that from a material perspective competition does not increase efficiency nor does it favor the short side. We have not yet studied whether player A's actual use of the possibility of changing his partner affects A's earnings. Figure 4 plots the earnings per play of the A players with the more often chosen B/C player (panel (a)) and the earnings of the more often chosen B/C player (panel (b)) against the actual number of plays. The broken horizontal line indicates the median number of plays, which is 22. The minimum of this variable is 15 rounds and 30 rounds the maximum. As can be seen from the simple linear regression lines there is a clear positive relationship between earnings and the number of plays. This visual impression is corroborated by Spearman rank order statistics (see Figure 4). To further characterize the relationship between earnings per play and the number of plays we calculate the average earnings above and below (or equal) the median number



(a) A player (b) More often chosen B/C player

Figure 4: Earnings (per play) of A and the more often chosen B/C player in CC as a function of the number of plays

of plays between A players and more often chosen B/C players. These earnings are depicted in Figure 4, above and below the broken horizontal line. They show that players with (strictly) above median length relationships earn more than those with relationships shorter than 22. Mann-Whitney tests indicate that these differences in earnings are statistically significant ($p = .0066$ and $p = .0031$ for A players and more often chosen B/C players, respectively). The results are qualitatively the same when we look at earnings per round instead of per play.

Result 3 *The number of times an A player chooses the same partner correlates positively with A's earnings. Similarly, for those B/C players who are chosen more often, the number of times they are chosen correlates positively with their earnings.*

An interesting question is how a stable relation is established. It turns out that first round behavior is important. An OLS regression of the total number of plays with the partner chosen in the first round as dependent variable finds strongly significant positive coefficients for A's first round decision (.953, $p = .005$) as well as for the partner's first round decision (1.212, $p = .003$) with an insignificant intercept (2.725, $p = .499$). Initial cooperative behavior, including that of the A player, has a strong positive influence on the stability of a relation.

For the less often chosen B/C player a similar positive relationship between number of plays with A and earnings is found when we look at earnings per round, instead of

per play. (Spearman's $\rho = .4941,\ p = .0121$). The median number of plays is 8. The earnings per round for less often chosen B/C players with strictly more than eight plays is 128.4, for those with less or equal to eight plays it is 109.6 (excluding those two who have never been chosen). A Mann-Whitney test shows that this difference in earnings is significant ($p = .0440$).[18]

Finally, it is interesting to note that the more often chosen players earn significantly more per play than the less often chosen ones. A Wilcoxon signed-ranks test yields that the difference in earnings is statistically significant ($p < .001$).

Our evidence shows that in CC, for player A, relying on a more bilateral relation is the most promising way to behave. However, even the relatively successful group of A-players with above median stable relations does not earn significantly more than subjects in the NCC ($p = .8382$, Mann-Whitney test). That is, compared to the situation without competition, in the CC players on the short-side do not profit from choosing one of the players for a long-term relation. For the A's with less than the median number of plays with the same partner, the result that they earn less than subjects in NCC is marginally significant ($p = .0696$, Mann-Whitney test).[19]

An interesting question emerging from the above results is, why can the A player not profit from the rivalry between B and C? Especially, in light of the arguments put forward in Section 2 where it is was shown that large gains by A can be sustained even in subgame perfect Nash equilibria The answer may be due to A's punishment behavior, in general, and partner choice behavior, in particular. If A could commit to always changing his trading partner after the partner choosing 0 and never switching

[18]The positive relationship between earnings and number of plays breaks down for the less often chosen players when looking at earnings per play. We actually find a significantly negative correlation between the number of rounds chosen and the earnings per play (Spearman's $\rho = -.3999, p = .0476$). This result is driven by the fact that some of the less often chosen players free-ride on cooperative A-players in early rounds and A players then do not choose them any more. This drives up the average per play earnings of these free-riders.

[19]Kollock (1994) and Brown, Falk and Fehr (2004) also find that in stylized incomplete contracting situations people tend to create bilateral relations. In accordance with our findings, the latter also find that longer relations generate larger rents and that early round behavior is an important determinant of the length of the relation. These authors, however, do not investigate the impact of competition, i.e. they do not study whether bilateral relations in the presence of competition lead to different outcomes than in the absence of competition.

after the partner choosing 10, then he might be able to capitalize on his advantageous position. However, since this commitment is not possible in our environment, B and C can not be sure of how A will behave. This uncertainty about A's future behavior, typical of incomplete contracts environments, may lead them to act opportunistically, choosing 0 even after successful cooperation in a round. In consonance with this, A may sometimes switch away from a partner who chose 10. All this could lead to a dilution of A's apparently advantageous situation.

To save on space, we elaborate on this issue in this and the following paragraph only briefly. The tables on which the results are based can be found in the Appendix. As suggested in the previous paragraph we find that A's rewarding and punishment behavior is indeed not completely consistent. If both, the A player and the chosen partner, make the cooperative choice 10 in a round $t-1$ the A player does not reward the partner in 59 out of 455 cases. That is, in 13% of all instances player A does not stay and cooperate with the same partner in round t. Similarly, if the chosen B/C player does not cooperate in a round $t-1$ the A player does not punish this behavior in 14 out of 74 cases. That is, in 19% of all instances A players do not sanction defecting partners by also defecting or switching to the other B/C player in round t (see Table 9 in the Appendix).

Another mode of behavior that is likely to increase efficiency and earnings is tit-for-tat play or conditional cooperative behavior. Here we find that compared to the NCC the behavior of A in the CC is less conditionally cooperative. A choice of 0 (10) by A in a round t following the partner's choice of 0 (10) in round $t-1$ is significantly less likely in the CC than in the NCC. The frequencies of such choices in the CC and the NCC are .723 (.828) and .797 (.926), respectively. According to χ^2-tests these differences of the relative frequencies across conditions are significant at least at the 5 percent level. Interestingly, in comparison to players with label B in the NCC, the B/C players in the CC behave similarly to the A players: 0 (10) choices after 0 (10) choices are significantly less frequent in the CC than in the NCC. χ^2-tests comparing the relative frequencies in the NCC and the CC yield $p < .001$ and $p = .113$ for choices of 0 and 10, respectively (see also Table 10 in the Appendix).

In summary, in the CC A players are not consistently sanctioning defecting behavior of their chosen partners and the propensity to behave conditionally cooperative is

weaker in the CC than in the NCC. Together, these facts suggest that the cooperative climate is not to better in the CC than in the NCC; perhaps it is even worse.

In this section we have looked at the impact of competition in the interaction phase in isolation. We summarize the results in our first regularity.

Regularity 1 *From an earnings perspective competition does neither increase efficiency nor favor the short side of the exchange relation.*

In Section 3.4 below, we will relate these results to our measures of subjects' experienced well-being and their behavioral disposition towards others, which will be discussed in the next two sections.

3.2 Subjective well-being after the interaction

We use both a general measure as well as a list of specific emotions to elicit subjects' subjective (experienced) well-being. Our general measure of subjective well-being is shown in Figure 5. After the interaction phase, subjects were asked to mark the number that best corresponded to their general mood in relation to the facial expressions of the so-called Self-Assessment Manikin.[20]

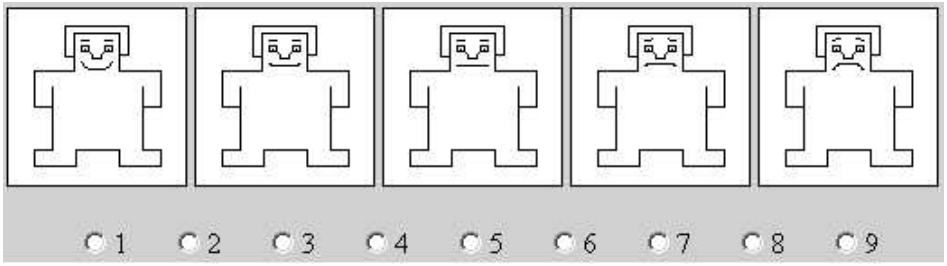


Figure 5: General measure of subjective well-being

In the figure, a "1" clearly corresponds to the highest level and a "9" to the lowest level of subjective well-being. In the reported measure that we use below we have inverted the score obtained from subjects' decisions in Figure 5, so that "1" is the minimum and "9" the maximum, to make it more easily comparable to the emotions scores reported below. Table 2 shows in the third row (labeled 'general well-being')

[20]These figures, developed by Lang (1980), are reprinted from Sonnemans (1991).

Table 2: Averages of specific emotion scores and general measure of subjective well-being across conditions and roles

	condition-role			
well-being/emotion	CC-A	CC-B/C m.o.	CC-B/C l.o.	NCC
general well-being^{a,b,c,d,f}	7.85	6.09	3.50	6.40
sadness^{a,b,c,e,f}	1.93	2.70	4.07	2.06
happy^{a,b,c,d,f}	5.04	4.26	3.00	4.07
shame^{a}	2.11	1.54	2.28	1.82
pride^{b,c,f}	3.78	4.00	2.78	3.75
fear^{a,e}	1.48	2.04	2.04	1.61
envy^{a,b,e,f}	1.85	3.15	3.67	2.43
relief^{b,c,f}	3.59	3.70	2.48	3.47
anger^{b,c,f}	2.07	2.80	4.46	2.75
joy^{b,c,d,f}	4.74	4.19	2.56	3.75
guilt	2.00	2.02	2.32	1.68
irritation^{a,b,d,f}	2.26	3.37	4.44	3.26
surprise^{f}	3.37	3.48	4.33	3.28
contempt^{b,f}	2.04	3.17	3.76	2.44
no. of obs	27	27	27	72†

Note: Scores for the individual emotions range from 1 ("not at all" experienced) to 7 ("very intense" experienced) and scores for well-being range from 1 (feel "very bad") to 9 (feel "very good"). "m.o." ("l.o.") stands for "more (less) often chosen". ^{a} significant difference between CC-A and CC-B/C m.o., ^{b} significant difference between CC-A and CC-B/C l.o., ^{c} significant difference between CC-B/C m.o. and CC-B/C l.o., ^{d} significant difference between CC-A and NCC, ^{e} significant difference between CC-B/C m.o. and NCC, ^{f} significant difference between CC-BC l.o. and NCC; all significances at least at 5 percent level, Mann-Whitney rank sum tests, two-tailed; † for pride $n = 71$ due to one missing observation.

the average values of the measure for the different conditions and roles of players. Our primary interest lies in differences across the NCC and the CC and across the different player positions within the CC. Result 4 summarizes these differences.

Result 4

A. For the NCC players general subjective well-being is lower than for the A players in the CC and higher than for the less often chosen B/C players in the CC.

B. General subjective well-being is not different between the NCC players and the more often chosen B/C players in the CC.

C. In the CC, general subjective well-being is higher for the A players than for the B/C players.

D. In the CC, general subjective well-being is lower for the less often chosen than for the more often chosen B/C players.

Support for this result can be found in Table 2. In the table the superscripts indicate significant differences of pairwise comparisons across player situations and conditions. For our general measure of subjective well-being all pairwise comparisons appear to be significant at least at the 5 percent level, with only one exception. (There is no significant difference between players in the NCC and the more often chosen B/C players in the CC.) Note, that in the CC the levels of our general measure of subjective well-being are different between all three player situations. Being on the short or long side does make a difference for subjective well-being. Those on the long side feel significantly worse than players on the short side. Moreover, being mostly excluded on the long side has an additional negative impact on subjective well-being. Observe also that, in comparison to the NCC, the reported scores of our general measure in the CC are at a higher, a lower and a similar level, depending on the position of the players. Hence, competition has led to an inequality in subjective well-being without generating material efficiency gains. Note also that average scores of our general measure of subjective well-being across all players in the CC is with 5.81 lower than for subjects in the NCC, where it is 6.40, although not significantly so ($p = .1884$).

Next to the general measure of subjective well-being subjects also reported the experienced intensity of a a number of specific emotions. Besides more specific information on the emotional state of the players this provides us also with a check of our general measure. We expect that negative (positive) emotions are negatively (positively) correlated with our global measure. Table 3 shows these correlations between our general measure and the individual emotions. The positive emotions happiness, pride, joy, and relief indeed show a significantly positive correlation with our general measure of subjective well-being. The negative emotions sadness, envy, anger, irritation, and contempt turn out to be clearly negatively correlated with our measure. In summary, subjects reporting higher subjective well-being, in the global measure, also report higher scores on positive and lower scores on negative emotions. This supports the interpretation that our global measure indeed measures how people feel and also demonstrates the close relation between subjective well-being in a more general sense and the intensity of experienced specific emotions.

Table 3: Correlation of emotions with general measure of subjective well-being

emotion	correlation coefficient	emotion	correlation coefficient
sadness	-.5997*	anger	-.6915*
	(.0000)		(.0000)
happiness	.7319*	joy	.7579*
	(.0000)		(.0000)
shame	-.0568	guilt	-.0234
	(.4852)		(.7740)
pride	.4013*	irritation	-.6489*
	(.0000)		(.0000)
fear	-.0902	surprise	-.2635*
	(.2673)		(.0010)
envy	-.4401*	contempt	-.4374*
	(.0000)		(.0000)
relief	.3563*		
	(.0000)		
	$n = 153^{\dagger}$		

Note: * denotes a statistically significant correlation coefficient; p-values in parentheses; † ... for pride $n = 152$ due to one missing observation.

Table 2 shows, from the forth row onwards, the average intensity of each of the specific emotions for each position in the interaction phase of the two conditions. In view of the findings concerning the general well-being and its relation with the specific emotions the observed patterns seem quite natural. Pairwise comparisons of the emotion scores between players' positions leads to the following result.

Result 5 *After the incomplete contract game:*

A. The A players in the CC appear to be in a better emotional state than the NCC players.

B. The less often chosen B/C players in the CC are in a worse emotional state than the NCC players.

C. In the CC the A players exhibit a better emotional state than the B/C players.

D. In the CC the less often chosen B/C players are in a much worse emotional state than the A players and the more often chosen B/C players.

Statistical support for this result can be found in Table 2 where the superscripts at the emotion names indicate significant differences in the pairwise comparisons across conditions and player roles. In relation to Result 5A subjects in the NCC report significantly lower levels of the positive emotions happiness and joy and a significantly higher level of the negative emotion irritation than the A players in the CC (see superscript d). Concerning Result 5B, the less often chosen B/C players report significantly higher intensities of the negative emotions sadness, envy, anger, irritation, and contempt and significantly lower intensities of the positive emotions happiness, pride, relief, and joy than players in the NCC (see superscript f). Concerning Result 5C, the A players report a significantly higher intensity of happiness and significantly lower intensities of sadness, envy, and irritation than both the more and less often chosen B/C players (see superscripts a and b). Regarding, Result 5D, the less often chosen B/C players report significantly higher intensities of the negative emotions sadness and anger and significantly lower intensities of the positive emotions happiness, pride, relief, and joy than both the A players and the more often chosen B/C players (see superscripts b and c).

In summary, the evidence presented in this section documents that there exists a clear relation between people's subjective well-being and their position in the incomplete contract game. In particular, being on the long side in the CC reduces their subjective well-being, which is reinforced for those often excluded from the interaction.

3.3 Disposition towards others before and after the interaction

Table 4 presents the averages and standard deviations of the angles observed in the circle tests of parts 1 and 3, distinguishing the NCC from the CC. For the CC we also distinguish between player types and, for the B/C players, between more and less often chosen ones. Previous use of social value orientation tests in economic experiments, as for instance in Offerman, Sonnemans, and Schram (1996), has shown that a large fraction of people give positive amounts to others before any interaction has taken place, evidencing positive sentiments towards strangers.

Focus first on initial angles on the left part of Table 4. Recall, that these were recorded before subjects were informed about the content of any of the remaining parts of the experiment. Hence, these angles can not be affected by behavior or even

Table 4: Disposition towards others - average angles in the circle tests

	initial angle of					final angle of							
	all	A	B/C (all)	B/C-m.o.	B/C-l.o.	all towards partner	all towards third party	A towards B/C-m.o.	A towards B/C-l.o.	B/C-m.o. towards A	B/C-m.o. towards B/C-l.o.	B/C-l.o. towards A	B/C-l.o. towards B/C-m.o.
NCC	15.37					10.67	9.68						
	(18.40)					(24.17)	(15.49)						
	[n=52][a]					[n=52][c]	[n=52][c]						
CC	14.01	14.90	13.58	19.20	7.96			14.54	6.93	12.49	12.59	-4.19	5.95
	(26.03)	(19.43)	(28.83)	(21.99)	(33.81)			(20.14)	(14.40)	(19.24)	(16.79)	(27.03)	(13.61)
	[n=80][b]	[n=26][b]	[n=54]	[n=27]	[n=27]			[n=26][d]	[n=26][d]	[n=27]	[n=27]	[n=27]	[n=27]

Note: "m.o." ("l.o.") stands for "more (less) often chosen; [a] observations of one session are missing due to technical problems; [b] one missing observation; [c] without observations that correspond to the missing observations in the first circle test (see [a]); [d] without observation that corresponds to the missing observation in the first circle test (see [b]); in the three cases where both B/C players are chosen exactly 15 times the average angles of the two players is used when calculating the angles for the "more often" and "less often" chosen players. Standard deviations in parentheses.

by expectations about behavior in the incomplete contract game. The average initial angles are 15.37 degrees in the NCC and 14.01 in the CC.[21] The difference is statistically not significant ($p = .8032$, Mann-Whitney test). In the CC, we also do not find a statistically significant difference in initial angles between those subjects who became an A player and those who became a B or C player. Interestingly, the initial angles of the subsequently more and less often chosen B/C players (19.20 vs. 7.96 degrees) hint towards a sorting out of the initially more selfish B/C players. However, this difference is statistically not significant ($p = .218$, Mann-Whitney test), which is due to the large standard deviation of the angles of the B/C-l.o..

Now consider the final angles shown on the right part of Table 4. These angles were measured after the interaction phase and, hence are payoff relevant expressions of post-interaction disposition towards others. Our main interest is in whether and how competition and experience during the interaction phase affect people's disposition towards others. We, therefore, focus here on changes in the angles and not on their levels. For both conditions we observe a general tendency for angles to decrease from the pre-game to the post-game situation. Such a general 'decay' is in line with the results of van Dijk, Sonnemans and van Winden (2002). More importantly, however, the observed changes clearly differ across conditions and roles. The pattern of these differences is summarized in the following result.

Result 6 *In comparison to the disposition towards others measured before the incomplete contract game:*
A. In the NCC, players' disposition towards their partners do not change, whereas it exhibits a decrease towards third parties.
B. In the CC, A players' disposition towards the more often chosen partner does not change, but decreases towards the less often chosen partner.
C. In the CC, the more often chosen B/C players' disposition towards A does not change, and decreases (marginally) towards their less often chosen counterpart.
D. In the CC, the less often chosen B/C players' disposition towards A decreases, but does not change towards their more often chosen counterpart.

In the NCC, the comparison of the initial angles (15.37) with the final angles towards the partner (10.67) yields $p = .1775$ (Wilcoxon signed-ranks test). In contrast, the

[21] An angle of 15 degrees implies a transfer to the other person of approximately 260 points.

initial angle is significantly different from the final angle towards the third party, which is 9.68 ($p = .0132$, Wilcoxon signed-ranks test).

How does this compare to the pattern in the CC? Here we need to look both at A and B/C players. As above, we distinguish again between more and less often chosen B/C players. Part B of the above result captures the A players' changes. The fact that - compared to their initial disposition - they do not significantly modify their disposition towards the more often chosen partner can be directly observed in Table 4 where A's average initial angle is 14.90 and the average final angle towards the more often chosen partner is 14.54 with very similar standard deviations. Concerning the less often chosen partner the final angle decreases to 6.93 and a Wilcoxon signed-ranks test indicates that this change is significant ($p = .0203$).

For the more often chosen B/C player the decrease in the angle from 19.20 (initial angle) to 12.49 (final angle) towards the A player is statistically not significant ($p = .1650$, Wilcoxon signed-ranks test). The decrease to 12.59 (final angle) regarding the less often chosen B/C fellow player is statistically marginally significant according to a Wilcoxon signed-ranks test ($p = .0552$).

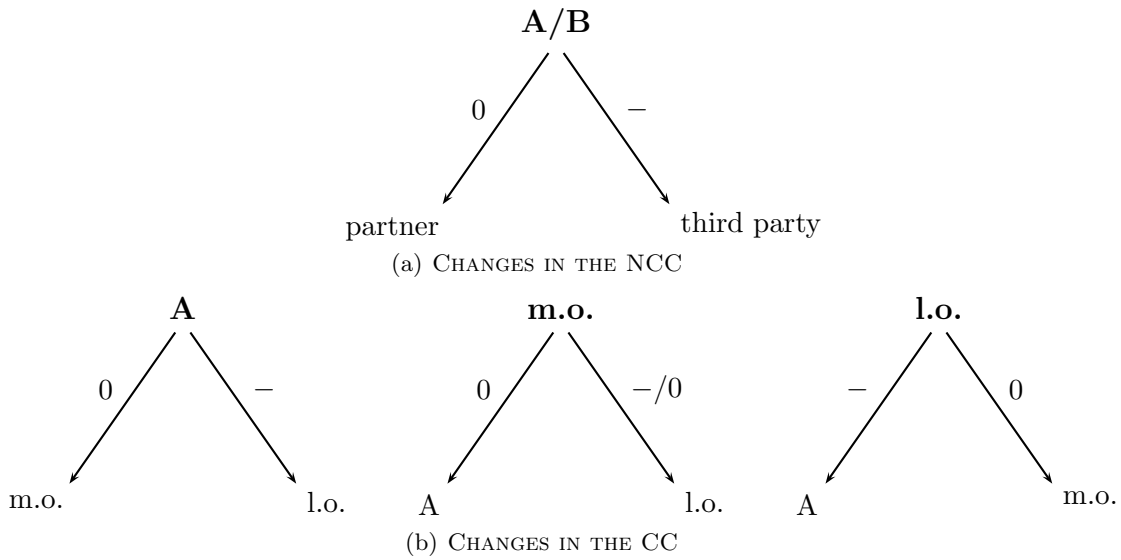
For the less often chosen B/C players the decrease in the angle from the initial value of 7.96 to -4.19 (final angle) regarding the A player is statistically highly significant ($p = .0018$, Wilcoxon signed-ranks test). Note, that the negative angle implies that, on average, less often chosen B/C players actually gave up money in order to reduce the earnings of A players. The decrease to 5.95 (final angle) towards more often chosen B/C fellow players is statistically insignificant ($p = .4178$, Wilcoxon signed-ranks test).

In summary, compared to their initial disposition towards others subjects in the NCC, who had to stay together for all 30 rounds, and subjects in the CC who interacted often with each other show no significant decrease in their disposition regarding each other. At the same time, in the NCC towards third parties a significant decrease in the disposition is observed. Such a decrease is also observed in the CC between those subjects who interacted relatively little with each other. A plausible interpretation of these observations is that subjects suffer from a considerable baseline distress (leading to some general decay in angles), and that, at the same time, they exhibit some specific goodwill concerning only those they interacted with relatively often. We have seen that the latter is related to success in the interaction. Thus, this result suggests that

between those who had many (successful) interactions there also exists a good basis for possible future interactions. At the same time the observations also indicate that with less often chosen partners no good basis for future interaction might exist. We examine the relation of interaction success and the disposition towards others in greater detail in the next section.

Figure 6 summarizes the changes in disposition towards others for the two conditions. Note, that the pattern of changes in the CC (panel (b)) can not be easily reconciled with notions of inequality aversion. Both the A players and the more often chosen - and, hence, successful - B/C players exhibit a decrease in the angle towards the remaining unsuccessful B/C player, who also earned less. (Recall, that B/C-l.o. players' earnings are about 46% of the A players' and 54% of the B/C-m.o. players' earnings; see Section 3.1). If players were trying to settle accounts in terms of earnings one should expect the opposite. The behavior of the less often chosen B/C can also not be explained solely in terms of payoffs. Although the average final angle towards A is negative (-4.19), meaning that A's payoff is decreased, the average final angle towards the more successful B/C players remains positive and does also not decrease significantly.

We summarize our findings of this and the previous section in our second regularity.



(a) Changes in the NCC

(b) Changes in the CC

Legend: In the figure a '−' ('−/0') indicates a statistically (marginally) significant decrease and a '0' indicates no statistically significant change; 'm.o.' and 'l.o.' stands for 'more often chosen B/C player' and 'less often chosen B/C player', respectively.

Figure 6: Graphical representation of the changes in disposition towards others

Regularity 2 *Subjective well-being and the dispositions towards others are strongly influenced by the interaction institution and the role in which a person participates in the incomplete contract game. In particular, being on the long side of the exchange situation has a strong negative effect on players' subjective well-being and their disposition towards players on the short side.*

3.4 What explains post-interaction well-being and disposition?

We have seen that both subjective well-being and disposition towards others are affected by people's position in the interaction phase. What remains to be discussed is what causes these differences. We presume the following relations: (i) disposition towards others after the interaction is affected by interaction success (earnings) and/or some key emotions; (ii) in turn, the emotions are triggered by the experience in the incomplete contract game which has two basic dimensions: interaction success and the treatment and position a person was in.

We first analyze the effect of interaction success, defined as total earnings over actual plays, on general subjective well-being and the different specific emotions. For general well-being and each specific emotion we have run separate OLS regressions with interaction success as explanatory variable. We discuss here the main results of these estimations. The detailed results can be found in Tables 11-13 in the Appendix. For the NCC players the central result is that general well-being as well as a number of positive emotions (happiness and joy) and negative emotions (sadness, envy, anger, irritation, and contempt) are strongly significantly related to interaction success. As one would expect the correlation of interaction success with well-being and the positive emotions is positive whereas these correlations are negative for negative emotions (Table 11 in the Appendix). These regression results clearly indicate that the emotional state of NCC players is strongly influenced by their earnings success in the incomplete contract game.

The picture turns out to be quite different for subjects in the CC. For the A players general well-being is only marginally significantly positively related to interaction success in plays with the more often chosen B/C player and insignificant regarding interaction success with the less often chosen player. Of the specific emotions only anger is correlated with interaction success in plays with both B/C players. Hence,

for players on the short side in the CC interaction success appears to have only little influence on their emotional state and general subjective well-being (Table 12 in the Appendix). For B/C players the influence of interaction success on subjective well-being depends strongly on whether a player is more or less often chosen. For the more often chosen B/C players general subjective well-being as well as the negative emotions envy, anger, irritation, and contempt and the positive emotions happiness, relief, and joy are strongly correlated with interaction success in the incomplete contract game. In contrast, for the less often chosen B/C players neither general subjective well-being nor any of the specific emotions exhibits a significant correlation with interaction success (Table 13 in the Appendix).

Recall that players' reported levels of general subjective well-being and emotion intensities strongly depend on the environment and role players are in (see Section 3.2). Together with the above reported asymmetries in the influence of interaction success on subjective well-being we have a clear indication that the experience of competition has an effect on subjective well-being that goes beyond the effect it has on material payoffs.

Next we examine potential determinants of behavior in the circle-tests taken after the experience with the incomplete contract game. This is especially interesting since behavior in this circle test can be seen as an indicator of the individual's future (i.e. after the game) cooperation propensity. We examined three models of seemingly unrelated regressions for both competition conditions and all player roles. In the models the independent variables are the final angles and the explanatory variables are the initial angle (initial disposition towards others) and the total earnings over plays (interaction success) and/or a set of six specific emotions (reflecting the subjective well-being of players).[22]

[22]First, note that our use of a limited set of positive and negative emotions as a measure of subjective well-being is akin to the use of U-indexes as introduced by Krueger (2005). The main reason for using specific emotions instead of indexes is that the former provide us with a finer measure. The six included emotions - sadness, fear, guilt, surprise, contempt, and happiness - were selected on the basis of a procedure designed with the following aims: (a) to facilitate the comparison of regression results across conditions and player situations we wanted to use the same set of emotions in all estimations; (b) for convenience the set should be small but still reflect the subjective well-being of the players; here we also wanted to avoid correlations between the emotions used as explanatory variables. The applied procedure was as follows. We first computed the (Spearman) correlation coefficients between

Table 5 presents regression results pertaining to the players in the NCC. In this case we need to distinguish between changes of disposition towards the partner and the randomly chosen third player. The (a) equation pertains to the interaction partner in the incomplete contract game and the (b) equation relates to the third player. In all three models the initial disposition towards others is a significant positive determinant of the final angles. Interestingly, interaction success (total earnings over plays) is never significant, neither alone nor in combination with the emotions. In contrast, of the six emotions, guilt, surprise and, especially, contempt do have a significant effect vis-à-vis the interaction partner (but not the third player). A statistical model comparison shows that models 2 and 3 are preferred above model 1 (see, bottom of the table). Hence, adding emotions does increase the explanatory power of the regressions whereas adding interaction success does not. Taking also into account the result that the emotions of players in the NCC are influenced by interaction success (see above and Table 11 in the Appendix) the overall picture that arises is that in the NCC earnings trigger some of the emotions which in turn, together with the initial disposition, determine people's post-interaction disposition towards their interaction partner. Note, that the effect of earnings is only indirect and mediated by the emotions.

Table 6 shows analogous regression results for the A players in the CC. Here, in all model specifications the (a) equations relate to the more often chosen B/C player and the (b) equations to the less often chosen one. As for players in the NCC the initial disposition towards others has a significantly positive effect whereas interaction success (total earnings over plays) has no effect in all three models. The emotion surprise has a significant effect in relation to both other players, sadness and happiness with respect to the more often chosen partner and contempt with respect to the less often chosen one. The statistical model comparisons show that including the emotions

players' final angles and each of the emotions separately, for each of the four player situations. In this way we eliminated three specific emotions (pride, envy and relief) which were in no case significant at the 5% level. Then we considered the remaining clusters of different types of positive, negative, and non-classified emotions: {joy, happiness}, {sadness, irritation, anger, contempt}, fear and surprise. For these clusters we applied two additional criteria. The first was the correlation between the emotions within a cluster (with p-values Bonferroni adjusted for multiple comparisons). Secondly, an emotion was selected only if it showed a significant correlation with final angles in both treatments. Since four of the selected six emotions are highly correlated with our measure of general well-being (see Table 3) this measure is not included in the set of explanatory variables.

Table 5: Determinants of the final angles of A and B players in NCC (Seemingly unrelated regressions)

	A and B players towards each other (#a equations) and unrelated third player (#b equations)					
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
Initial	.4870**	.4601**	.3926*	.3910**	.3937*	.3910**
angle	(.003)	(.000)	(.014)	(.000)	(.014)	(.000)
Interaction	.0549		.0200			
success	(.320)		(.751)			
Sadness			-1.499	1.034	-1.684	1.034
			(.526)	(.471)	(.463)	(.471)
Fear			.5779	-3.223	.4419	-3.223
			(.855)	(.100)	(.888)	(.100)
Guilt			4.504*	2.296	4.612*	2.296
			(.050)	(.106)	(.043)	(.106)
Surprise			3.808*	-.1007	3.780*	-.1007
			(.022)	(.923)	(.023)	(.923)
Contempt			-5.075**	-.0354	-5.120**	-.0354
			(.007)	(.976)	(.006)	(.976)
Happiness			-.6068	2.3760	-.3247	2.3760
			(.790)	(.071)	(.878)	(.071)
Constant	-10.43	2.602	-3.713	-6.678	.7016	-6.678
	(.450)	(.264)	(.837)	(.351)	(.951)	(.351)
R^2	.1845	.2986	.3608	.3911	.3586	.3911
N^a	52	52	52	52	52	52
Model comparisons		Model 1 vs Model 2		Model 2 vs Model 3		
LR χ^2		23.20		.0100		
p-value		.0275		.7514		

Note: ** significant at the 1 percent level, * significant at the 5 percent level. ^{a} one missing initial angle observation due to technical problems in one session. The two observations in which A has chosen the same partner for all 30 rounds are excluded. $p-$values between parentheses.

Table 6: Determinants of the final angles of A players in CC
(Seemingly unrelated regressions)

	A player towards more often (#a equations) and less often (#b equations) chosen B/C player					
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
Initial	.4240*	.1817	.4790**	.3260**	.4791**	.2804*
angle	(.026)	(.206)	(.002)	(.004)	(.002)	(.014)
Interaction	-.0014	.0025	.0002	.0029		
success	(.501)	(.313)	(.918)	(.148)		
Sadness			8.733**	2.035	8.626**	3.383
			(.002)	(.320)	(.001)	(.075)
Fear			-3.125	1.360	-3.059	.2368
			(.343)	(.572)	(.345)	(.921)
Guilt			4.462	-.6431	4.387	.6967
			(.075)	(.738)	(.067)	(.693)
Surprise			4.928**	3.309**	4.916**	3.146*
			(.004)	(.006)	(.004)	(.013)
Contempt			-.8142	3.658**	-.7965	3.356*
			(.656)	(.005)	(.662)	(.012)
Happiness			6.242*	1.504	6.267*	1.459
			(.038)	(.477)	(.037)	(.509)
Constant	17.58	1.318	-61.53**	-33.64**	-60.30**	-30.89*
	(.213)	(.792)	(.004)	(.008)	(.001)	(.018)
R^2	.2012	.1051	.6142	.6270	.6137	.5926
N^a	24	24	24	24	24	24
Model comparisons		Model 1 vs Model 2		Model 2 vs Model 3		
LR χ^2		32.24		2.20		
p-value		.0013		.3336		

Note: ** significant at the 1 percent level, * significant at the 5 percent level. ^{a} one missing initial angle observation due to technical problems in one session. The two observations in which A has chosen the same partner for all 30 rounds are excluded. $p-$values between parentheses.

significantly improves the estimation but interaction success does not (see bottom of the table). Recall from above that the emotions of A players in the CC are not affected by interaction success (see also Table 12 in the Appendix). Hence, for the A players in the CC interaction success neither directly nor indirectly (via the emotions) influences their final angles towards their interaction partners. In contrast, the emotional state is an important direct determinant for the final disposition towards the interaction partners on the short side of the exchange relation.

The regression results for the more often chosen B/C players in the CC are shown in Table 7. Here the (a) equations refer to the A player and the (b) equations to the other - less often chosen - B/C player. In all three models, there are important differences between the (a) and the (b) regressions, reflecting the asymmetry of the relations with the other two players. The initial disposition towards others (initial angle) is significantly positive vis-à-vis the less often chosen B/C player, but insignificant vis-à-vis the A player. In model 1 interaction success with the A player has a significantly positive effect on the final angel towards this player. When adding the emotions (model 2) this effect vanishes, however. Of the emotions, sadness and surprise are influencing the final angle towards the A player and fear and happiness the final angle towards the less often chosen B/C player. Interestingly, in all cases the emotions exhibit a negative sign. The statistical model comparisons show that adding the emotions improve the estimations marginally and removing interaction success has no significant effect at all.

A possible interpretation of the regression results pertaining to the A player is that interaction success and the emotions carry a similar informational value for explaining the more often chosen B/C players' disposition towards the player on the short side. Additionally, since the significant emotions (sadness and surprise) are not correlated with interaction success (see above and Table 13 in the Appendix) these two forces seem to be independent from each other. With respect to the less often chosen B/C player the baseline disposition towards others together with the emotional state determines the final angle towards this player.

Table 8 shows the regression results for the less often chosen B/C players. Here the (a) equations concern the A player and the (b) equations concern the other - more often chosen - B/C player. Note first that adding the emotions marginally improves the estimation whereas removing interaction success has no significant effect. Again,

Table 7: Determinants of the final angles of more often chosen B/C players in CC (Seemingly unrelated regressions)

	More often chosen B/C player towards A (#a equations) and less often (#b equations) chosen B/C player					
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
Initial	.2440	.5245**	.2067	.4774**	.2435	.4774**
angle	(.113)	(.000)	(.109)	(.000)	(.063)	(.000)
Interaction	.0036*		.0021			
success	(.013)		(.165)			
sadness			-5.113*	-.7943	-5.269*	-.7943
			(.030)	(.667)	(.031)	(.667)
Fear			-.3257	-3.404*	.2815	-3.404*
			(.885)	(.049)	(.902)	(.049)
Guilt			4.170	1.452	4.984*	1.452
			(.066)	(.397)	(.028)	(.397)
Surprise			-3.779*	-1.090	-3.987*	-1.090
			(.031)	(.426)	(.028)	(.426)
Contempt			-.8791	-1.013	-1.742	-1.013
			(.582)	(.379)	(.253)	(.379)
Happiness			-4,712	-4.325*	-4.388	-4.325*
			(.056)	(.025)	(.085)	(.025)
Constant	-12.11	2.718	39.06*	35.12**	49.82**	35.12**
	(.186)	(.422)	(.025)	(.004)	(.002)	(.004)
R^2	.2587	.4640	.5380	.6232	.5029	.6232
N^a	25	25	25	25	25	25
Model comparisons		Model 1 vs Model 2		Model 2 vs Model 3		
LR χ^2		18.91		1.86		
p-value		.0908		.1732		

Note: ** significant at the 1 percent level, * significant at the 5 percent level. ^{a} one missing initial angle observation due to technical problems in one session. The two observations in which A has chosen the same partner for all 30 rounds are excluded. $p-$values between parentheses.

Table 8: Determinants of the final angles of less often chosen B/C players in CC (Seemingly unrelated regressions)

	Less often chosen B/C player towards A (#a equations) and more often (#b equations) chosen B/C player					
	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
Initial	.6751**	.1051	.5201**	.1283	.5193**	.1283
angle	(.000)	(.146)	(.000)	(.155)	(.000)	(.155)
Interaction	.0035		.0007			
success	(.220)		(.748)			
Sadness			2.143	-.8394	2.095	-.8394
			(.208)	(.592)	(.220)	(.592)
fear			-3.118	-.6637	-3.260	-.6637
			(.135)	(.724)	(.112)	(.724)
Guilt			-.3687	-.5459	-.2677	-.5459
			(.817)	(.705)	(.865)	(.705)
Surprise			-.7733	-1.756	-.6951	-1.756
			(.618)	(.214)	(.652)	(.214)
Contempt			-3.920**	2.111	-4.010**	2.111
			(.009)	(.119)	(.007)	(.119)
Happiness			-.8542	.3309	-.9166	.3309
			(.646)	(.846)	(.622)	(.846)
Constant	-15.14**	4.097	8.776	8.570	10.34	8.570
	(.005)	(.063)	(.378)	(.284)	(.236)	(.284)
R^2	.6479	.0781	.8071	.1832	.8101	.1832
N^a	25	25	25	25	25	25
Model comparisons			Model 1 vs Model 2		Model 2 vs Model 3	
LR χ^2			19.51		.1800	
p-value			.0769		.6700	

Note: ** significant at the 1 percent level, * significant at the 5 percent level. ^{a} one missing initial angle observation due to technical problems in one session. The two observations in which A has chosen the same partner for all 30 rounds are excluded. $p-$values between parentheses.

the (a) and (b) regressions show very different results. In all model specifications all regression coefficients regarding the other B/C player are never significantly different from zero. Hence, the final angle of the less often chosen B/C players towards their more often chosen counterparts seems to be erratic. In contrast, concerning the A player the regression results are very clear-cut. Next to the initial disposition towards others it is the negative emotion contempt which explains the final angle very well ($R^2 > .80$ for models 2 and 3). Interaction success (earnings over plays) has no direct influence on the final angle towards the A player (see models 1 and 2 in Table 8). There is also no indirect influence via the emotions because - for the less often chosen B/C players - none of them is correlated with interaction success (see Table 13 in the Appendix).[23]

We summarize the main observations concerning the determinants of disposition towards others after the experience in the incomplete contract game in the following result.

Result 7 *For the final disposition towards others we find that:*
A. For players in the NCC it depends only indirectly on interaction success, mediated by emotions.
B. For the A players in the CC it does not depend on interaction success but is strongly influenced by the emotional state.
C. For the more often chosen B/C players in the CC the final disposition towards the A players is influenced by interaction success and also by the emotional state, which also influences the final disposition towards the less often chosen B/C players.
D. For the less often chosen B/C players the final disposition towards the A players is independent of interaction success but is strongly influenced by the negative emotion contempt, while with respect to the more often chosen B/C players none of the variables has a significant effect.

[23] One might argue that the desire to reduce earnings inequalities drives the final disposition of the less often chosen B/C players towards their richer A players. To test this we have also run regressions where we included 'total earnings across rounds' as a measure of interaction success and/or the 'relative total earnings across rounds of the less often chosen B/C player with respect to the A and the more often chosen B/C players' as explanatory variables. It turns out that these variables are never significant and that the emotion 'contempt' stays significant at the 1% level in all alternative specifications. Hence, for our results the explanation that less often chosen B/C players punish A players because of earnings inequalities seems to have no bite.

From Section 3.2 we know that general subjective well-being and the emotional state of players strongly depend on the competitiveness of the institution players participate in as well as their position in the competitive environment. We have also seen that interaction success, measured by earnings, is insufficient to explain these differences. The above result shows that the emotional state rather than pure monetary gains are determining behavior after the experience with the incomplete contract game. In summary, this leads to the following regularity.

Regularity 3 *Mediated by the emotional state, the experience with competition as such and the role people are immersed in in the competitive environment are important determinants of the disposition towards others, while interaction success plays only a minor role.*

4 Final Comments

We find that *competition matters*, but in a very different way than is typically assumed in economics. In our experimental exchange environment with incomplete contracts competition does neither enhance efficiency nor does it increase the earnings of the short side of the exchange relation. It does have positive effects on the subjective (experienced) well-being of people on the short side. However, competition has hidden costs that are related to people's emotional reaction to lack of control and the possibility of exclusion from trade. Being exposed to the competitive environment lowers subjective well-being and triggers negative emotions for those on the long side. Competition has also adverse effects on the behavioral disposition towards those interacted with. Experience with competition appears to decrease the subsequent willingness to help. This effect is strongest for those who are frequently excluded. Importantly, these effects can not be explained by earnings differences generated during the interaction alone. In summary, competition does not show up as a very positive force in our experiment.

One can speculate about potential longer term effects of our findings. The kind of competition we study clearly deteriorates the social relations between interaction partners and considerably depresses the subjective well-being of those on the long side of exchange who are often excluded from interaction. These facts may lead to the obstruction of future cooperation. Note, that the formation of mostly stable bilateral

relations can not completely solve this problem. In most competitive situations bilateral relations necessarily imply the exclusion of some parties from materially beneficial interactions. Additionally, in a dynamic society established bilateral relations will not hold forever. When interactions between new partners have to take place, they may bring together parties with a negative disposition towards others. In addition, the subjective well-being of those parties that have previously been frequently excluded from the interaction may be low. This in turn may feed back to individuals' behavior with possibly adverse effects on efficiency.

In our experiment the interplay between psychological effects and allocative and distributional choices turns out to be significant. The results observed in our experiment indicate that people's motivation and the economic environment they are acting in are not independent from each other. It would be interesting and important to examine if such effects are long lasting and if they indeed spill-over to other economic environments. If this turned out to be true, it would would affect the very basis of how economists think about competitive interaction. Our study may serve as a basis of research in this direction.

In a more general sense, our evidence is in favor of the view that socio-psychological influences and those aspects of human interaction mostly related to material welfare and pecuniary incentives can (and should) not always be kept apart or disentangled. Granovetter (1985) refers to this as the embeddedness of economic activity in social relations. The interpersonal rivalry implied by competition can hurt the social relations which are necessary for the successful pursuit of material wealth. Our results add to but are different from the criticism of market economies put forward by Lane (1991 and 2000). His point is, in essence, that in market economies people are drawn into striving too much for material things at the expense of companionship. Our contribution consists in providing evidence of the social and affective costs of competition as such.

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Appendix

Table 9: Partner switching behavior and choices of A

choice of partner of A in $t-1$	choice of A in $t-1$: 0			choice of A in $t-1$: 10		
	choice of A in t			choice of A in t		
	0	10	Total	0	10	Total
0	67 (n=135)	14 (n=26)	81 (n=161)	14 (n=35)	25 (n=39)	39 (n=74)
10	30 (n=63)	10 (n=30)	40 (n=93)	11 (n=31)	28 (n=424)	39 (n=455)
Total	97 (n=198)	24 (n=56)	121 (n=254)	25 (n=66)	53 (n=463)	78 (n=529)

Note: The entries depict the absolute frequencies of partner switching by A in period t in dependence of the choice of the partner of A in $t-1$ and of A himself in $t-1$ and t. Total number of observations in parentheses.

Table 10: Reciprocal behavior in choices

choice. of partner of A in $t-1$	treatment: NCC			treatment: CC		
	choice of A in t			choice of A in t		
	0	10	Total	0	10	Total
0	.797	.203		.723	.277	
	243	62	305	170	65	235
10	.074	.926		.172	.828	
	55	684	739	94	454	548

choice of A in $t-1$	treatment: NCC			treatment: CC		
	choice of B in t			choice of chosen B/C in $t-1$		
	0	10	Total	0	10	Total
0	.854	.146		.701	.299	
	239	41	280	178	76	254
10	.109	.891		.138	.862	
	83	681	764	73	456	529

Note: Entries depict the relative and absolute frequencies of (non-) cooperative choices by A (B/C) in period t in dependence of the choices of the partner of A (B/C) in $t-1$.

Table 11: Subjective well-being as a function of interaction success - Players in NCC (OLS regressions)

	Subjective well-being (emotion score) of players as a function of interaction success (total earnings over plays) with each other					
	sub-sample of observations with all circle test data			full sample		
	coef.	st.err.	# obs.and fit	coef.	st.err.	# obs.and fit
general well-being						
interaction success	.00099**	.00019	$n = 52$	.00110**	.00015	$n = 72$
	(0.000)			(0.000)		
constant	-1.0332	1.4152	adj. $R^2 = .35$	-1.8954	1.1595	adj. $R^2 = .42$
	(0.469)			(0.107)		
sadness						
interaction success	-.00040**	.00011	$n = 52$	-.00037**	.00010	$n = 72$
	(0.001)			(0.000)		
constant	5.10555**	.86924	adj. $R^2 = .18$	4.8796**	.77536	adj. $R^2 = .15$
	(0.000)			(0.000)		
happiness						
interaction success	.00062**	.00013	$n = 52$	.00065**	.00010	$n = 72$
	(0.000)			(0.000)		
constant	-.60097	.96617	adj. $R^2 = .31$	-.81259	.79657	adj. $R^2 = .36$
	(0.537)			(0.311)		
shame						
interaction success	.00003	.00012	$n = 52$	-.00010	.00011	$n = 72$
	(0.788)			(0.378)		
constant	1.5732	.88496	adj. $R^2 = -.02$	2.5459**	.83279	adj. $R^2 = -.00$
	(0.082)			(0.003)		
pride						
interaction success	.00028	.00015	$n = 52$	.00035**	.00013	$n = 72$
	(0.062)			(0.009)		
constant	1.6260	1.1052	adj. $R^2 = .05$	1.1409	.98456	adj. $R^2 = .08$
	(0.147)			(0.251)		
fear						
interaction success	.00001	.00009	$n = 52$	-.00005	.00009	$n = 72$
	(0.944)			(0.604)		
constant	1.5286*	.69377	adj. $R^2 = -.02$	1.9544**	.67129	adj. $R^2 = -.01$
	(0.032)			(0.005)		
envy						
interaction success	-.00041*	.00017	$n = 52$	-.00037*	.00014	$n = 72$
	(0.022)			(0.011)		
constant	5.5970**	1.3015	adj. $R^2 = .08$	5.2223**	1.0892	adj. $R^2 = .08$
	(0.000)			(0.000)		

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Note: ** significant at the 1 percent level, * significant at the 5 percent level; $p-$values between parentheses.

Table 11: *continued*

	Subjective well-being (emotion score) of players as a function of interaction success (total earnings over plays) with each other					
	sub-sample of observations with all circle test data			full sample		
	coef.	st.err.	# obs.and fit	coef.	st.err.	# obs.and fit
relief						
interaction success	.00024	.00016	$n = 52$	.00024	.00014	$n = 72$
	(0.141)			(0.097)		
constant	1.5263	1.2398	adj. $R^2 = .02$	1.6777	1.0843	adj. $R^2 = .03$
	(0.224)			(0.126)		
anger						
interaction success	-.00072**	.00016	$n = 52$	-.00067**	.00014	$n = 72$
	(0.000)			(0.000)		
constant	8.0992**	1.2272	adj. $R^2 = .27$	7.8398**	1.0599	adj. $R^2 = .24$
	(0.000)			(0.000)		
joy						
interaction success	.00065**	.00015	$n = 52$	.00065**	.00012	$n = 72$
	(0.000)			(0.000)		
constant	-1.0619	1.1228	adj. $R^2 = .27$	-1.1614	.94771	adj. $R^2 = .27$
	(0.349)			(0.224)		
guilt						
interaction success	.00020	.00012	$n = 52$	.00014	.00009	$n = 72$
	(0.096)			(0.149)		
constant	.26935	.90073	adj. $R^2 = .04$	.64609	.72089	adj. $R^2 = .02$
	(0.766)			(0.373)		
irritation						
interaction success	-.00084**	.00017	$n = 52$	-.00083**	.00014	$n = 72$
	(0.000)			(0.000)		
constant	9.4749**	1.2504	adj. $R^2 = .33$	9.5560**	1.0735	adj. $R^2 = .33$
	(0.000)			(0.000)		
surprise						
interaction success	-.00031	.00019	$n = 52$	-.00037*	.00016	$n = 72$
	(0.113)			(0.022)		
constant	5.5645**	1.4368	adj. $R^2 = .03$	6.1039**	1.2281	adj. $R^2 = .06$
	(0.000)			(0.000)		
contempt						
interaction success	-.00049**	.00017	$n = 52$	-.00034*	.00015	$n = 72$
	(0.005)			(0.023)		
constant	6.0928**	1.2599	adj. $R^2 = .13$	4.9968**	1.1188	adj. $R^2 = .06$
	(0.000)			(0.000)		

Note: ** significant at the 1 percent level, * significant at the 5 percent level; $p-$values between parentheses.

Table 12: Subjective well-being as a function of interaction success - A players in CC (OLS regressions)

	Subjective well-being (emotion score) of A-players as a function of interaction success (total earnings over plays) with					
	more often chosen B/C-player			less often chosen B/C-player		
	coef.	st.err.	# obs.and fit	coef.	st.err.	# obs.and fit
general well-being						
interaction success	.00030	.00015	$n = 27$	-.00036	.00026	$n = 25$
	(.054)			(0.181)		
constant	5.9882**	.95753	adj. $R^2 = .11$	8.3206**	.47557	adj. $R^2 = .04$
	(.000)			(.000)		
sadness						
interaction success	-.00031*	.00014	$n = 27$	.00046	.00025	$n = 25$
	(.041)			(.080)		
constant	3.8615**	.93487	adj. $R^2 = .12$	1.3413**	.45335	adj. $R^2 = .09$
	(.000)			(.007)		
happiness						
interaction success	.00021	.00011	$n = 27$	-.00024	.00018	$n = 25$
	(.065)			(.202)		
constant	3.7184**	.70956	adj. $R^2 = .10$	5.3046**	.33067	adj. $R^2 = .03$
	(.000)			(.000)		
shame						
interaction success	-.00013	.00013	$n = 27$	.00024	.00022	$n = 25$
	(.330)			(.271)		
constant	2.8906**	.81626	adj. $R^2 = -.00$	1.7322**	.38859	adj. $R^2 = .01$
	(.002)			(.000)		
pride						
interaction success	-.00035	.00021	$n = 27$	.00068*	.00032	$n = 25$
	(.096)			(.048)		
constant	5.9843**	1.3269	adj. $R^2 = .07$	2.8316**	.58335	adj. $R^2 = .12$
	(.000)			(.000)		
fear						
interaction success	-.00007	.00011	$n = 27$	.00004	.00020	$n = 25$
	(.510)			(.835)		
constant	1.9471*	.72445	adj. $R^2 = -.02$	1.4611**	.35117	adj. $R^2 = -.04$
	(.013)			(.000)		
envy						
interaction success	-.00015	.00014	$n = 27$	.00005	.00025	$n = 25$
	(.297)			(.853)		
constant	2.7862**	.91073	adj. $R^2 = .01$	1.8539**	.44352	adj. $R^2 = -.04$
	(.005)			(.000)		

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Note: ** significant at the 1 percent level, * significant at the 5 percent level; $p-$values between parentheses.

Table 12: *continued*

	Subjective well-being (emotion score) of A-players as a function of interaction success (total earnings over plays) with					
	more often chosen B/C-player			less often chosen B/C-player		
	coef.	st.err.	# obs.and fit	coef.	st.err.	# obs.and fit
relief						
interaction success	.00006	.00020	$n = 27$	-.00007	.00031	$n = 25$
	(.749)			(.821)		
constant	3.1930*	1.2812	adj. $R^2 = -.04$	3.6598**	.54902	adj. $R^2 = -.04$
	(.020)			(.000)		
anger						
interaction success	-.00040**	.00014	$n = 27$	.00053*	.00026	$n = 25$
	(.009)			(.048)		
constant	4.5685**	.92029	adj. $R^2 = .21$	1.3989**	.45970	adj. $R^2 = .12$
	(.000)			(.006)		
joy						
interaction success	.00015	.00012	$n = 27$	-.00031	.00019	$n = 25$
	(.230)			(.117)		
constant	3.8050**	.79064	adj. $R^2 = .02$	5.1203**	.34036	adj. $R^2 = .06$
	(.000)			(.000)		
guilt						
interaction success	-.00004	.00015	$n = 27$	.00035	.00023	$n = 25$
	(.786)			(.134)		
constant	2.2581*	.97776	adj. $R^2 = -.04$	1.3794**	.40579	adj. $R^2 = .06$
	(.029)			(.002)		
irritation						
interaction success	-.00030	.00018	$n = 27$	.00044	.00031	$n = 25$
	(.097)			(.160)		
constant	4.1570**	1.1430	adj. $R^2 = .07$	1.7279**	.54858	adj. $R^2 = .04$
	(.001)			(.004)		
surprise						
interaction success	.00003	.00021	$n = 27$	-.00019	.00035	$n = 25$
	(.889)			(.591)		
constant	3.1865*	1.3573	adj. $R^2 = -.04$	3.7136**	.63289	adj. $R^2 = -.03$
	(.027)			(.000)		
contempt						
interaction success	-.00011	.00018	$n = 27$	.00005	.00031	$n = 25$
	(.534)			(.883)		
constant	2.7438*	1.1645	adj. $R^2 = -.02$	2.0538**	.55990	adj. $R^2 = -.04$
	(.027)			(.001)		

Note: ** significant at the 1 percent level, * significant at the 5 percent level; $p-$values between parentheses.

Table 13: Subjective well-being as a function of interaction success - B/C players in CC (OLS regressions)

	Subjective well-being (emotion score) of more and less often chosen chosen B/C-player as a function of interaction success (total earnings over plays) with the A-player					
	more often chosen B/C-player			less often chosen B/C-player		
	coef.	st.err.	# obs.and fit	coef.	st.err.	# obs.[a] and fit
general well-being						
interaction success	.00063**	.00017	$n = 27$	.00026	.00039	$n = 25$
	(.001)			(.522)		
constant	2.3736*	1.0682	adj. $R^2 = .33$	3.2700**	.70712	adj. $R^2 = -.02$
	(.036)			(.000)		
sadness						
interaction success	-.00014	.00012	$n = 27$	-.00041	.00035	$n = 25$
	(.272)			(.263)		
constant	3.4984**	.75752	adj. $R^2 = .01$	4.5419**	.63908	adj. $R^2 = .01$
	(.000)			(.000)		
happiness						
interaction success	.00024*	.00011	$n = 27$	-.00007	.00029	$n = 25$
	(.036)			(.803)		
constant	2.8734**	.66737	adj. $R^2 = .13$	3.1918**	.52287	adj. $R^2 = -.04$
	(.000)			(.000)		
shame						
interaction success	.00001	.00009	$n = 27$	-.00041	.00032	$n = 25$
	(.903)			(.216)		
constant	1.4757*	.53425	adj. $R^2 = -.04$	2.8387**	.57404	adj. $R^2 = .03$
	(.011)			(.000)		
pride						
interaction success	.00009	.00012	$n = 27$	-.00011	.00028	$n = 25$
	(.465)			(.689)		
constant	3.4892**	.73661	adj. $R^2 = -.02$	2.8954**	.51104	adj. $R^2 = .01$
	(.000)			(.000)		
fear						
interaction success	.00009	.00011	$n = 27$	-.00048	.00031	$n = 25$
	(.431)			(.135)		
constant	1.5168	.69523	adj. $R^2 = -.01$	2.6978**	.56228	adj. $R^2 = .06$
	(.039)			(.000)		
envy						
interaction success	-.00037*	.00015	$n = 27$	.00001	.00037	$n = 25$
	(.021)			(.988)		
constant	5.2923**	.93491	adj. $R^2 = .16$	3.4717**	.66600	adj. $R^2 = -.04$
	(.000)			(.000)		

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Note: [a] in two cases one of the B/C-players was never chosen as interaction partner; ** significant at the 1 percent level, * significant at the 5 percent level; $p-$values between parentheses.

Table 13: *continued*

	Subjective well-being (emotion score) of more and less often chosen chosen B/C-player as a function of interaction success (total earnings over plays) with the A-player					
	more often chosen B/C-player			less often chosen B/C-player		
	coef.	st.err.	# obs.and fit	coef.	st.err.	# obs.[a] and fit
relief						
interaction success	.00028*	.00013	$n = 27$	-.00029	.00032	$n = 25$
	(.046)			(.375)		
constant	2.0738	.83139	adj. $R^2 = .12$	2.9562**	.56908	adj. $R^2 = -.01$
	(.020)			(.000)		
anger						
interaction success	-.00048**	.00012	$n = 27$	-.00025	.00043	$n = 25$
	(.001)			(.571)		
constant	5.5963**	.78188	adj. $R^2 = .34$	4.7173**	.77430	adj. $R^2 = -.03$
	(.000)			(.000)		
joy						
interaction success	.00033**	.00011	$n = 27$	-.00000	.00032	$n = 25$
	(.005)			(.995)		
constant	2.2454**	.67747	adj. $R^2 = .24$	2.5631**	.57868	adj. $R^2 = -.04$
	(.003)			(.000)		
guilt						
interaction success	.00007	.00011	$n = 27$	.00008	.00034	$n = 25$
	(.524)			(.804)		
constant	1.5983*	.69646	adj. $R^2 = -.02$	2.2507**	.60642	adj. $R^2 = -.04$
	(.030)			(.001)		
irritation						
interaction success	-.00062**	.00012	$n = 27$	-.00009	.00048	$n = 25$
	(.000)			(.849)		
constant	7.0144**	.76545	adj. $R^2 = .49$	4.4201**	.85722	adj. $R^2 = -.04$
	(.000)			(.000)		
surprise						
interaction success	-.00019	.00015	$n = 27$	-.00012	.00041	$n = 25$
	(.221)			(.772)		
constant	4.5733**	.92987	adj. $R^2 = .02$	4.4257**	.74689	adj. $R^2 = -.04$
	(.000)			(.000)		
contempt						
interaction success	-.00055**	.00017	$n = 27$	-.00061	.00046	$n = 25$
	(.003)			(.195)		
constant	6.3864**	1.0438	adj. $R^2 = .28$	4.5984**	.82935	adj. $R^2 = .03$
	(.000)			(.000)		

Note: [a] in two cases one of the B/C-players was never chosen as interaction partner; ** significant at the 1 percent level, * significant at the 5 percent level; $p-$values between parentheses.